

REMARKS

Claims 1-4 are all the claims presently pending in the application. The Abstract and claims 1 and 3-4 are amended to more clearly define the invention. Claims 1 and 4 are independent.

These amendments are made only to more particularly point out the invention for the Examiner and not for narrowing the scope of the claims or for any reason related to a statutory requirement for patentability.

Applicant also notes that, notwithstanding any claim amendments herein or later during prosecution, Applicant's intent is to encompass equivalents of all claim elements.

Claims 1 and 3-4 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Setaka et al. (U.S. Patent No. 4,881,414). Claim 2 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Setaka et al. in view of Xie et al. (U.S. Patent No. 5,606,254).

These rejections are respectfully traversed in the following discussion.

I. THE CLAIMED INVENTION

An exemplary embodiment of the claimed invention, as defined by, for example, independent claim 1, is directed to a rotation angle detecting device that includes a target having a spur gear shape rotatable together with a rotary member. The target includes a plurality of magnetic teeth protruding at a substantially equal pitch in a circumferential direction of an axis of the rotary member. Each of the magnetic teeth are defined by a pair of side faces, and a crest surface between the side faces in the circumferential direction. Angular portions are formed at boundaries between the side faces and the crest surfaces of all of the teeth. The rotation angle detecting device also includes magnetic sensors that are

arranged so as to confront the plurality of teeth for outputting output signals according to a rotation of the rotary member, thereby to detect a rotation angle of the rotary member based on the output signals.

Conventional rotation angle detecting devices have gears with teeth that have a gentle curve between the crest and the side. This gentle curve makes it very difficult to test the accuracy of the magnetic sensor that is arranged so as to confront the plurality of teeth on the gears.

In stark contrast, the present invention provides a rotation angle detecting device having teeth with angular portions that are formed at boundaries between the side faces and the crest surfaces of all of the teeth. In this manner, the pitch of the teeth may be directly measured by referencing the angular portions, the gear may be more easily manufactured and the interaction with the magnetic sensor that is arranged so as to confront the plurality of teeth on the gears does not have any discrepancy. (Page 9, lines 22-24, page 10, lines 9-11, and page 12, lines 6-7).

II. THE DOUBLE PATENTING REJECTION

The Office Action rejects claims 1-3 under the judicially created doctrine of obviousness-type double patenting over claims 1-3 of U.S. Patent No. 6,763,733.

In particular, the Examiner alleges that, although the claims are not identical, they are not patentably distinct from each other because “the are both related to a rotational angle detection device with similar recitation of a magnetic teeth target wheel and a magnetic sensor to provide an indication of angular displacement between two shafts.” (Emphasis added).

Applicant respectfully traverses this rejection.

First, the Examiner's double patenting rejection fails to comply with the requirements for such a double patenting rejection as set forth in the M.P.E.P. § 804:

"Any obviousness-type double patenting rejection should make clear:

(A) The differences between the inventions defined by the conflicting claims - a claim in the patent compared to a claim in the application; and

(B) The reasons why a person of ordinary skill in the art would conclude that the invention defined in the claim in issue is an obvious variation of the invention defined in a claim in the patent." (M.P.E.P. § 804).

The Examiner's obviousness-type double patenting rejection fails to provide either of (A) or (B) above and, therefore, clearly fails to provide a *prima facie* case for double patenting.

Despite the Examiner's failure to present a *prima facie* case for obviousness-type double patenting, Applicant has closely reviewed claims 1-3 in U.S. Patent No. 6,763,733 and will address at least one of the clear differences between claims 1-3 in U.S. Patent No. 6,763,733 and claims 1-3 of the present application.

None of claims 1-3 in U.S. Patent No. 6,763,733 recite target teeth having angular portions that are formed at boundaries between the side faces and the crest surfaces. As explained above, this feature is important for allowing for the pitch of the teeth to be directly measured by referencing the angular portions, easier manufacturing of the target and reducing any discrepancy with the interaction between the target teeth and the magnetic sensor that is arranged so as to confront the plurality of teeth on the targets.

Applicant respectfully requests withdrawal of the double patenting rejection.

III. THE PRIOR ART REJECTIONS

A. The Setaka et al. reference

Regarding the rejection of claims 1 and 3-4, the Examiner alleges that the Setaka et al. reference teaches the claimed invention. Applicant submits, however, that there are elements of the claimed invention which are neither taught nor suggested by the Setaka et al. reference.

The Setaka et al. reference does not teach or suggest the features of the claimed invention including a magnetic sensor that is arranged so as to confront the plurality of teeth on the gears. As explained above, this feature, in combination with the teeth having angular portions that are formed at boundaries between the side faces and the crest surfaces of all of the teeth is important for allowing for the pitch of the teeth to be directly measured by referencing the angular portions, easier manufacturing of the target and reducing any discrepancy with the interaction between the gear teeth and the magnetic sensor that is arranged so as to confront the plurality of teeth on the target.

In stark contrast, the torque detection apparatus that is disclosed by the Setaka et al. reference discloses a sensor (stator 14) that clearly does not confront the teeth of any target at all. Rather, the stator 14 confronts the outside surface of the outer rotor 12.

Indeed, the teeth 28 of the outer rotor 12 confront the teeth 25 of the inner rotor 11, and vice-versa. None of the teeth 25 and 28 confront the stator 14.

Clearly, the Setaka et al. reference does not teach or suggest the features of the claimed invention including a magnetic sensor that is arranged so as to confront the plurality of teeth on the targets.

Further, the device that is disclosed by the Setaka et al. reference does not teach or suggest a target having magnetic teeth. This feature is important because the magnetic teeth

generate a magnetic field that is sensed by an inductive sensor (e.g., a magnetic sensor).

Rather, and in stark contrast, the Setaka et al. reference discloses a stator 14 that includes exciting coils 17-a and 18-a that generate magnetic fields that are modulated by the interaction between the teeth on the inner and outer rotors 11 and 12. This disturbance is sensed by the stator 14 with detecting coils 17-b and 18-b.

Thus, the Setaka et al. reference operates in a manner that is completely opposite to an exemplary embodiment the claimed invention. Rather, than having a target with magnetic teeth (as recited by independent claims 1 and 4) that generate a magnetic field, the Setaka et al. reference discloses a stator 14 that generates a magnetic field and relies upon conductive, but non-magnetic inner and outer rotors to modulate that field.

Therefore, the Setaka et al. reference does not teach or suggest each and every element of the claimed invention and the Examiner is respectfully requested to withdraw this rejection of claims 1 and 3-4.

B. The Setaka et al. reference in view of the Xie et al. reference

Regarding the rejection of claim 2, the Examiner alleges that the Xie et al. reference would have been combined with the Setaka et al. reference to form the claimed invention. Applicant submits, however, that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention.

Specifically, the Setaka et al. reference is directed to providing a more reliable, smaller size, and more highly accurate torque detector than strain gauge types of detectors, phase-difference types of detectors, and magnetic flux density varying type of detectors.

(Col. 1, line 5 - col. 2, line 6).

In stark contrast, the Xie et al. reference is directed to the completely different and unrelated problem of providing a small, inexpensive, durable variable reluctance rotation sensor generating high output voltages in the presence of low rotational speeds and/or large air gaps. (Col. 2, lines 7-11).

One of ordinary skill in the art who was concerned with providing a more reliable, smaller size, and more highly accurate torque detector as the Setaka et al. reference is directed to providing would not have referred to the Xie et al. reference because the Xie et al. reference is directed to the completely different and unrelated problem of providing a small, inexpensive, durable variable reluctance rotation sensor generating high output voltages in the presence of low rotational speeds and/or large air gaps.

Further, the Setaka et al. reference discloses a torque detector where the teeth on the rotors are completely enclosed and, thereby, protected by a housing.

In stark contrast, the Xie et al. reference is directed to addressing the problems encountered by rotational speed detectors that have teeth which are completely exposed to damage and, as a result, may become broken.

Lastly, the Setaka et al. reference has absolutely nothing to do with rotational speed sensors and the Xie et al. reference has absolutely nothing to do with torque sensors.

Clearly, these references would not have been combined.

Even assuming arguendo that one of ordinary skill in the art would have been motivated to combine these references, the combination would not teach or suggest each and every element of the claimed invention.

None of the applied references teaches or suggests the features of the claimed

invention including a magnetic sensor that is arranged so as to confront the plurality of teeth on the targets in combination with target teeth with angular portions that are formed at boundaries between the side faces and the crest surfaces of all of the teeth.

As explained above, the Setaka et al. reference clearly does not teach or suggest these features of the claimed invention.

The Xie et al. reference does not remedy this deficiency.

Indeed, the Xie et al. reference does not mention anything at all that is even remotely relevant to the shape of target teeth, let alone disclose target teeth with angular portions that are formed at boundaries between the side faces and the crest surfaces of all of the teeth as recited by the independent claims.

Clearly, the Xie et al. reference does not teach or suggest the features of the claimed invention including a magnetic sensor that is arranged so as to confront the plurality of teeth on the targets in combination with target teeth with angular portions that are formed at boundaries between the side faces and the crest surfaces of all of the teeth.

Therefore, the Examiner is respectfully requested to withdraw the rejection of claim 2.

IV. FORMAL MATTERS AND CONCLUSION

In view of the foregoing amendments and remarks, Applicant respectfully submits that claims 1-4, all the claims presently pending in the Application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

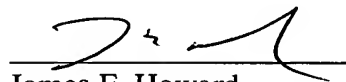
Should the Examiner find the Application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed

below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

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